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Indian Standard

CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF OUTDOOR POWER LINE CARRIER EQUIPMENT

PART I LINE TRAPS

UDC 621·315·052·63 : 621·316·9 . 621·372·54·7 : 006·76

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Rs **5·00** *March* 1982

Indian Standard

CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF OUTDOOR POWER LINE CARRIER EQUIPMENT

PART I LINE TRAPS

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AMENDMENT NO. 1 OCTOBER 1983
TO
IS:9859(Part I)-1981 CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF OUTDOOR POWER LINE CARRIER EQUIPMENT
PART I LINE TRAPS

(*Page 1, Committee Composition, second col, line 2*) - Substitute 'Gujarat Electricity Board, Baroda' *for* 'Gujarat State Electricity Board, Ahmadabad'

(LTDC 25)

Reprography Unit, ISI, New Delhi, India

Indian Standard

CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF OUTDOOR POWER LINE CARRIER EQUIPMENT

PART I LINE TRAPS

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 27 May 1981, after the draft finalized by the Power Line Carrier Systems and Associated Telecontrol Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This standard is intended to serve as a guide to installation engineers, contractors and users of power line carrier equipment, as far as line traps are concerned.

0.3 In view of the consideration that this code is required to be in conformity with the prevailing practice in India, considerable assistance has been derived from the Indian Electricity Rules, 1956 while drafting this code. Reference to the relevant provisions of the Indian Electricity Rules, 1956 has, therefore, been made at appropriate places with a view to bringing to the notice of the installation and/or maintenance engineer(s) the statutory regulations concerning this work.

0.4 This standard covers installation and maintenance of line traps. The following other parts of this standard are under preparation:

Part II Coupling devices

Part III Coupling capacitors/CVT

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard

1. SCOPE

1.1 This standard (Part I) covers installation and maintenance of line traps generally used in outdoor installations

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* Rules for rounding off numerical values (*revised*)

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 8792-1978* shall apply.

3. EXCHANGE OF INFORMATION

3.1 Before ordering the line traps, information should be exchanged between the owner, switchyard designer, transmission line designer, installation engineer, maintenance engineer and manufacturer, so that the line trap is procured to suit the duty, location and installation conditions under which the line trap will operate.

3.2 The engineer should obtain well in advance all relevant information about the overall dimensions, weight for transport, installation, etc, of the line trap. When the main coil, tuning device, bird barrier and protective device are packed separately, a packing list and drawings showing the assembly shall be supplied to the user.

4. GENERAL REQUIREMENTS

4.1 The manufacturer shall provide drawings and instructions for the installation and maintenance of the line trap well in advance of the delivery. It is essential that the installation of the line trap as well as its maintenance are performed in accordance with the instructions given by the manufacturer.

4.2 All electrical installations shall comply with the requirements of the Indian Electricity Act (1910) and Rules (1956) made thereunder.

4.3 If considered necessary, the local authorities concerned in the administration of the rules and regulations in the manner of layout of installation shall be consulted in regard to the rules and regulations that may be applicable.

4.4 The installation shall be carried out only by authorized persons competent to undertake such work under the rules and regulations that may be in force in different states.

5. INSTALLATION DESIGN

5.1 General — The installation shall be done in such a manner that maximum safety to operational and maintenance personnel is assured.

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* Specification for line traps.

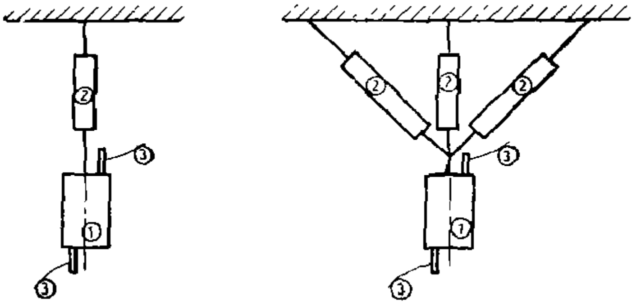
5.2 Arrangement

5.2.1 The following are the basic ways of installing line traps:

a) *Suspension*

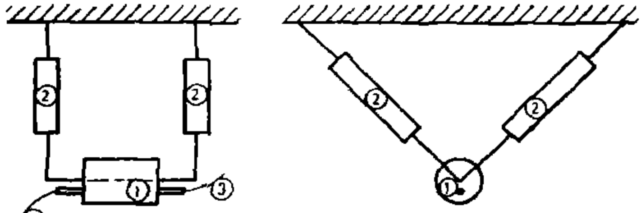
- i) Vertical axis, single point suspension from the gantry (*see* Fig. 1A);
- ii) Vertical axis, multipoint suspension from the gantry (*see* Fig. 1B);
- iii) Horizontal axis, single point suspension at each end of the line trap from the gantry (*see* Fig. 1C),
- iv) Horizontal axis, multipoint suspension at each end of the line trap from the gantry (*see* Fig. 1D); and
- v) Vertical axis, suspension from the transmission line.

NOTE — The arrangement at (v) may be adopted only when other alternatives given above are not feasible



1A Vertical Axis, Single Point Suspension from Gantry

1B Vertical Axis, Multipoint Suspension from Gantry



(END VIEW OF LINE TRAP)

1C Horizontal Axis, Single Point Suspension at Each End of Line Trap from Gantry

1D Horizontal Axis, Multipoint Suspension at Each End of Line Trap from Gantry

① Line Trap
② Strain Insulator String
③ Current Carrying Conductor

FIG. 1 TYPICAL METHODS OF SUSPENSION OF LINE TRAPS

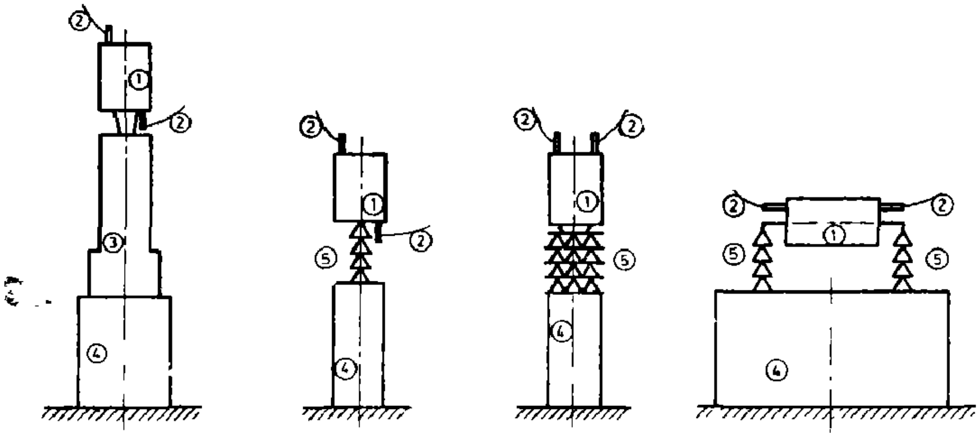
b) *Supported*

i) Vertical axis, supported by a coupling capacitor/CVT (*see* Fig. 2A);

ii) Vertical axis, supported by a single insulator stack on a structure (*see* Fig. 2B);

iii) Vertical axis, supported on three or more insulator stacks on a structure (*see* Fig. 2C); and

iv) Horizontal axis, supported by one insulator stack at each end of the line trap on a structure (*see* Fig. 2D).



2A Vertical Axis, Supported By a Coupling Capacitor/CVT

2B Vertical Axis, Supported By a Single Insulator Stack on a Structure

2C Vertical Axis, Supported on three or More Insulator Stacks on a Structure

2D Horizontal Axis, Supported By One Insulator Stack at Each End of Line Trap on a Structure

① Line Trap
② Current Carrying Conductor
③ Coupling Capacitor
④ Supporting Structure
⑤ Post Insulator

FIG. 2 TYPICAL METHODS OF SUPPORTING LINE TRAPS

c) *Suspended and/or Supported*

  i) Two line traps suspended one below the other;

  ii) One line trap suspended from the transmission line and the other from the gantry [*see* Note under **5.2.1**(a)(v)]; and

  iii) One line trap mounted on coupling capacitor/CVT and the other suspended from gantry or transmission line [*see* Note under **5.2.1**(a)(v)].

5.2.2 The method of installation to be adopted shall depend on the following factors :

a) Whether the power line is a transmission line or a power cable. (If the power line is a cable, a gantry for suspending the line trap may not be available),

b) Geometry of the line trap;

c) Mechanical forces (such as, weight, wind forces and forces due to short circuit);

d) Availability of space in the switchyard; and

e) Electrical clearances.

5.2.3 Before deciding on a particular method of installation of the line trap, it should be verified from the manufacturer that the method can be adopted

5.2.4 The following guidelines may be used:

a) Mounting the line trap on top of a coupling capacitor or CVT shall normally be considered only with the specific approval of the manufacturer of the coupling capacitor or CVT,

b) Line traps having a diameter larger than 1 m shall preferably be supported by three or more insulator stacks, symmetrically placed;

c) In EHV applications, where suspension insulator strings are long, it is preferable to use two or more strings in 'Vee' formation, in order to reduce swinging, and

d) Non-magnetic separation between the support/suspension and the line trap may be necessary in certain cases. This should be checked with the manufacturer.

5.3 Electrical Connections to the Line Trap

5.3.1 *General* — Depending on the type of application required, the electrical connections to the line trap may be line conductors, cables or bus bars

5.3.2 In a majority of applications, the connections are made to the transmission line conductor. The conductor should not be mechanically loaded by the weight of the line trap Similarly, the line should not exert a pull on the line trap.

5.3.3 Connectors of appropriate material shall be used depending on the material of line/jumper conductors and material of line traps/terminals.

5.3.4 Clamps and connectors for ACSR conductor to the line trap shall preferably be of compression type.

5.3.5 Manufacturers generally provide alternative positions and types of terminals Depending upon the type of installation, an optimum choice of terminals may be made

5.4 Clearances — All parts of the line trap are considered live and therefore minimum clearances between the line trap and other phases and between line trap and earth should be maintained in all conditions. Due allowances should be given to take care of conductor movements and sagging in worst conditions The recommended clearances are given in Table 1.

5.5 Rating of Line Traps — The rating of the line trap shall normally be influenced by the following:

a) The actual continuous current carrying capacity of the transmission line or the required short time current/dynamic current capacity corresponding to the station bus fault level, whichever is higher;

b) The ambient temperature and elevation above mean sea level;

c) Blocking bandwidth; and

d) Blocking impedance in the band (which in turn takes into account the characteristic impedance of the line or power cable, the type of coupling, etc).

6. INSTALLATION

6.1 Some manufacturers supply the main coil, tuning device and protective device separately. Before installing the line trap, it should be checked that the tuning device and the protective device are assembled and connected properly. The details of the tuning device and the line trap should be properly recorded, preferably on a name-plate fixed to the nearby structure, preferably the associated coupling capacitor/CVT.

TABLE 1 MINIMUM ELECTRICAL CLEARANCES

(*Clause* 5 4)

SYSTEM VOLTAGE RATING (HIGHEST SYSTEM VOLTAGE) (1) kV (rms)	IMPULSE WITHSTAND LEVEL * (2) kV (peak)	MINIMUM CLEARANCE BETWEEN PHASE AND EARTH † (3) mm	MINIMUM CLEARANCE BETWEEN PHASES (4) mm	MINIMUM CLEARANCE FROM ANY POINT WHERE THE MAN MAY BE REQUIRED TO STAND TO THE NEAREST UNSCREENED CONDUCTOR IN AIR (SECTIONAL CLEARANCE) (5) m
12	60 (List 1)	90	90	—
	75 (List 2)	120	120	—
36	145 (List 1)	—	270	—
	170 (List 2)	320	320	3
72·5	325	630	630	3·5
123	450	900	900	3 5
	550	1 100	1 100	4
145	450	900	900	3 5
	550	1 100	1 100	4
	650	1 300	1 300	4
245	650	1 300	1 300	4
	750	1 500	1 500	—
	850	1 600	1 700	4 5
	950	1 900	1 900	4 5
	1 050	2 400	2 100	5

NOTE — The values for system voltage rating of 400 kV are under consideration.

* The impulse withstand levels are as given in IS 2165-1977 'Insulation coordination (*second revision*)' For guidance regarding choice between List 1 and List 2 for rated voltages 12 kV and 36 kV and between levels against higher rated voltages, *see* IS : 2165-1977

† The values of minimum clearance to earth are based on Table 6A of IS . 3716-1978 'Application guide for insulation coordination (*first revision*)'.

6.2 The line trap shall be carefully handled to avoid damage or breakage; the tuning device and protective device are likely to get damaged, if not handled carefully.

6.3 Slinging shall be carried out only at the lugs provided for it.

6.4 Where bus bars are used for connections, joints should be either tinned, silver plated or should have a small coating of any conducting grease to ensure good contact. For bimetallic joints, no tinning or plating should be resorted to.

7. MAINTENANCE

7.1 Routine Maintenance — Line traps do not require much maintenance. However, whenever the line outage is taken, preferably the line trap may be physically inspected for loose connections, and tuning device and protective device may be cleaned. Bird nests or beehives inside the main coil may be removed. The tuning device shall be closely inspected and replaced if it shows signs of damage.

INDIAN STANDARDS

ON

POWER LINE CARRIER SYSTEMS AND ASSOCIATED TELECONTROL EQUIPMENT

IS :	
1885 (Part L)-1978	*Electrotechnical vocabulary: Part L Telecontrol*
8792-1978	Specification for line traps
8793-1978	Methods of tests for line traps
8997-1978	Specification for coupling devices for PLC systems
8998-1978	Methods of tests for coupling devices for PLC systems
9482-1980	Characteristic values of inputs and outputs of single sideband PLC terminals
9528 (Part I)-1980	Manual for planning of (SSB) PLC systems: Part I PLC systems
9528 (Part II)-1980	Manual for planning of (SSB) PLC systems: Part II PLC systems planning
9859 (Part I)-1981	Code of practice for installation and maintenance of outdoor power line carrier equipment: Part I Line traps

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Printed at Manipal Power Press, Manipal, S India.